

Sept. 18, 1962

W. LIMBERGER
COPYING DEVICES

3,054,340

Filed Nov. 30, 1959

2 Sheets-Sheet 1

FIG. 1

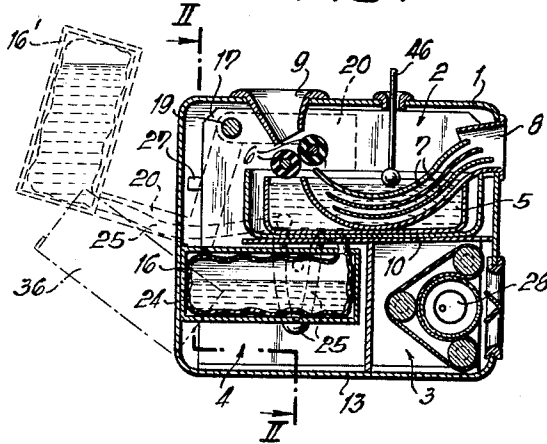


FIG. 2

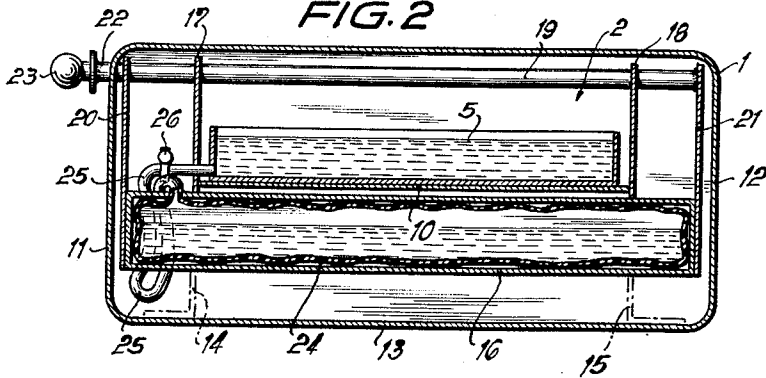


FIG. 3

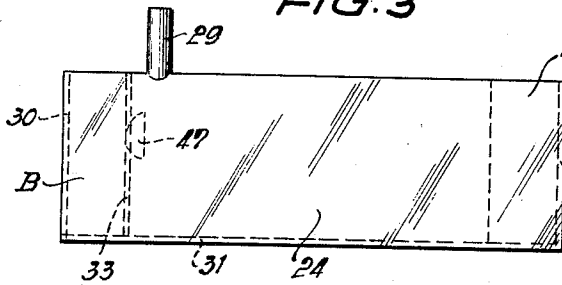
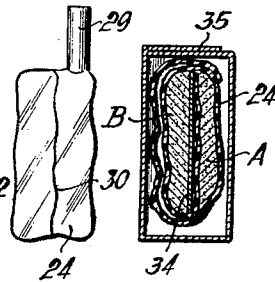


FIG. 4

FIG. 5



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2 Sheets-Sheet 2

FIG. 6

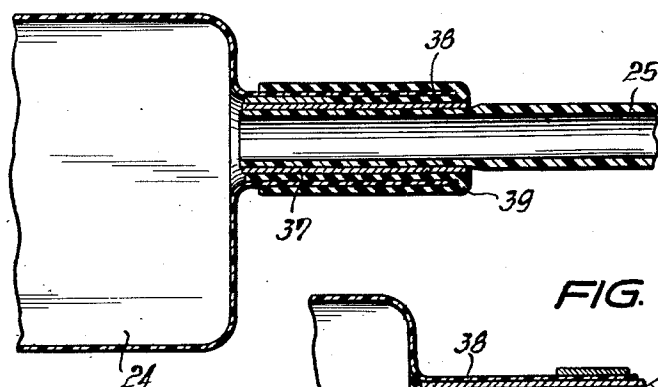


FIG. 6a

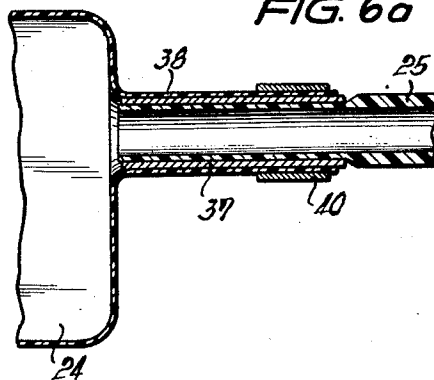
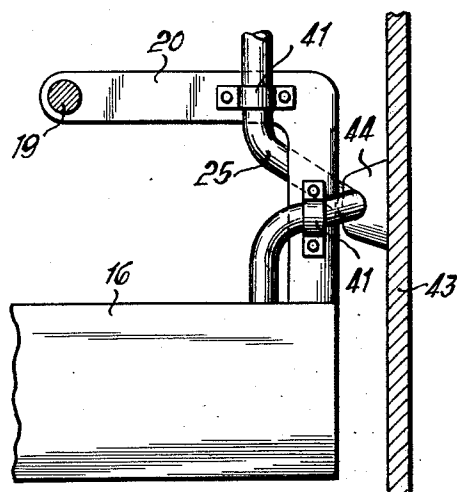


FIG. 7



1

3,054,340

COPYING DEVICES

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6 Claims. (Cl. 95—89)

The invention relates to improvements in copying devices and particularly is directed to a copying device provided with developing means consisting of a liquid container provided with guide paths for light sensitive layer carriers, subsequently simply called layer carriers, and a supply container for the developing liquid communicating with the liquid container.

According to the preferred embodiment, the invention is a single housing which accommodates the developing means and also an exposure device thus providing an apparatus adapted to perform all processing steps necessary for making a copy.

Developing devices with a bath container for the developing liquid have the disadvantage that the container is open so that the developing liquid is exposed to the air over a relatively large area, particularly when the container has a trough-like shape. Due to this an oxidation of the developing liquid may take place which decreases the efficiency of the developing liquid. This disadvantage is particularly noticeable when the device is used for short times only. This is often the case where the devices are used in offices and where they must always be ready for use but the total time they are really in use during a day often amounts to only about one hour or less.

Another drawback of the known top open, trough-like developing containers must be seen in that the liquid may easily be spilled, if the apparatus is transported or moved to another place, especially so, if the apparatus is tilted or rocked back and forth.

Other shortcomings of the known devices are due to the fact that the preparation of the developing liquid requires a certain amount of skill as on one hand the ingredients must be dosed correctly, and on the other hand a complete dissolution of all ingredients must be obtained. In this respect it should be considered, that for instance, the ingredients hydroquinone and phenidone do not dissolve as readily as the other ingredients, caustic potash and sulfite of sodium. It is found to be a disadvantage of the known devices that the solution is prepared in an open container requiring that the person must be very careful to avoid soiling or damage of the garments she is wearing, when preparing the solution and filling the developer into the apparatus.

The main object of this invention is the provision of means to avoid these disadvantages.

One object of the invention is to provide an apparatus in which the supply container is tiltably attached to the liquid container, or to a housing in which the liquid container is arranged, and is adapted to be moved in a first position beneath the trough of the liquid container and into a second position at least partly above the trough, a flexible closable connection being provided between the supply container and the liquid container.

Another object of the invention is to provide a supply container being foldable and made of plastic material, e.g. a foil of polyethylene, arranged in a hinged case provided with an inlet opening for the connecting hose. Preferably the supply container extends over the entire width of the apparatus, with a pivoted lever or levers extending on both sides of the developing container. Thus the supply container may have a length of for example 70 cm. forming substantially a hose-like structure.

2

Another object of the invention is to provide pivoted levers having an angular form and holding the case in such a way that one branch of the angular lever is connected to the upper edge of the supply container arranged within the housing and extends vertically upwardly, while the other branch extends parallel to the upper side of the apparatus or the supply container, respectively, the end of which is fastened to the pivot shaft. The pivot shaft may for example on one side of the apparatus be extended outwardly and be provided with an actuating handle.

Another object of the invention is to provide closing or stopping means for the connection between the supply container and the developing container which may according to a simple embodiment consist of a so-called pinchcock. Preferably however a closing or stopping device is provided which is actuated by a limit stop and which is arranged in such a way that the stopping device will be opened by a stop arranged on one branch of the pivoted lever upon tilting the supply container to its second position. In this arrangement the container may be swung to its second position in which the stopping device will open automatically and liquid will flow out into the developing container. The liquid level in this container is indicated by a liquid level indicator, for instance in the form of a float in connection with an indicator means extending out of the housing, so that the supply container may be swung back as soon as the predetermined liquid level in the developing container is attained, whereby the stopping means is closed. It is to be understood however, that this stopping means actuated by a limit stop may be opened independently from said limit stop to empty the developing container into the supply container while in a swung-in position.

Another object of the invention is to provide a certain arrangement for the flexible connecting hose between the supply container and the developing container by which a stopping device is avoided. This is achieved by wrapping the hose around a part being tiltable with the supply container, for example one of the angular levers, which in the swung-in position of the supply container abuts a stop fixedly arranged on the housing. This stop is positioned on that side on which the hose is wrapped around the angular lever, so that the hose will be pressed together in the swung-in position.

Another object of the invention is to provide an exposure device within the housing arranged on the operating side below the developing device the depth of which does not extend further than to the middle of the apparatus. Thus within the rear space of the lower part of the housing there is room for arranging the supply container. The rear wall of the housing is either provided with an aperture or a detachable cover allowing the supply container to be swung out at the rear side of the housing, if desired.

The supply container which according to the invention is made of plastic-foil in the form of a hose is particularly advantageous, as according to another object of the invention it may be used at the same time for packing the undissolved ingredients for the developing liquid. According to a particularly advantageous embodiment of the supply container a subdivision is arranged at one end of it by a detachable connection of the wall sections providing a space in which preferably those ingredients are packed which will dissolve more readily. The detachable connection may for instance be made by using a water soluble glue or mechanically by providing serrations engaging each other. It is not essential that this subdivision is absolutely water tight as its purpose is obtained already, when the flow of water into the subdivided space is restricted or delayed. In order to facilitate the opening of this wall connection

a preferred embodiment is provided with several grips for example in the form of lips which are fastened on the outside of the hose-like container in the zone of this connection by means of which the adhering wall sections may be pulled apart. In order to provide a proper connection of the connecting hose with the readily foldable supply container and at the same time to avoid any possibility of an unintentional buckling at this place the end of the connecting hose is preferably reenforced by a metal sleeve which may be inserted into the connecting socket of the supply container. This metal sleeve is provided with an additional hose which is freely extending from the metal sleeve and which after insertion into the connecting socket is rolled over it.

Another object of the invention is to provide an especially purposive use of the supply container made of plastic foil for packing the undissolved ingredients of the developing liquid by initially keeping these ingredients separated from each other at the ends of the hose-like container which then preferably with an interposed cardboard is rolled up. Thus mixing of the ingredients within the hose-like container is avoided by the folds due to the windings. After unfolding the container and, if occasion arises, opening the mentioned wall connection the ingredients within the container may be dissolved after liquid has been filled into it, thus making it merely necessary for the person preparing the developing liquid to fill-in water, without coming in contact with the developing liquid.

Further advantages and objects of the invention will become evident from the following description in connection with the drawings in which the invention is shown by way of example only, and to which the invention is by no means restricted, as changes are possible without departing from the scope of the invention.

In the drawings:

FIG. 1 is a sectional side view of the apparatus according to the invention in which only those parts are shown which are essential for the conception of the invention;

FIG. 2 is a section along the line II—II of FIG. 1;

FIG. 3 is a plan view of one embodiment of the supply container formed from a hose of plastic material;

FIG. 4 is an end view of the container according to FIG. 3;

FIG. 5 is a section through a package of the ingredients for the developing liquid using a supply container according to FIG. 3;

FIG. 6 and FIG. 6a are sectional views in an enlarged scale through alternative forms of a special connection of the supply container with the connecting hose, and

FIG. 7 is a partial view of a special arrangement of an automatic closure device of the connecting hose with the supply container in a swung-in position.

The apparatus shown in FIG. 1 comprises a housing 1 the interior of which is subdivided into three spaces 2, 3, 4. Space 2 is located at the upper side of the apparatus and serves to receive a container 5 for developing liquid which is provided with guidepaths 7 leading through the liquid to a pair of squeezing rollers 6 for passing layer carriers therethrough. The guidepaths begin at an insertion slot 8 of the housing. Behind the pair of squeezing rollers a discharge slot 9 is arranged on the upper side of the housing.

The container 5 for example is supported on a partition 10 which, as may be seen in FIG. 2, extends at least in the rear part of the housing only over the middle part of the housing, ending at a spaced distance from the side walls 11, 12 of the housing.

Bracings 14, 15 for example which are arranged in the lower part, and within the space 3 only, rest on the bottom 13 of the housing and serve to support the partition 10. By this arrangement the space 4 of the housing is free to receive the entire width of the case 16. Within the upper part of the housing plates 17, 18 extend

in a plane with the upper ends of braces 14, 15 and parallel to the side walls of the housing which serve to rotatably support a shaft 19.

The case 16 is tiltably suspended on the shaft 19. According to the illustrated embodiment angularly formed levers 20, 21 are arranged between the case 16 and the shaft 19 the upper branches of which have their ends hingedly connected with the shaft 19, extending approximately parallel to the upper side of the container or upper side of the housing respectively when the case 16 is in a swung-in position, and extending beyond the upper edge of the case 16 and directed inward towards the middle of the apparatus; said upper branches are then connected with the case 16 by the other branches extending about vertically in the swung-in position. The arrangement of the angularly formed levers 20, 21 and the case 16 thus forms a U opening towards the rear wall of the container. FIG. 2 shows that the angular levers 20, 21 are arranged relatively close to the side walls of the housing, so that the case 16 may occupy practically the entire width of the housing 1. The depth of the case 16 corresponds substantially to that of space 4 of the housing.

The lever 20 is dimensioned so that the case 16 in its swung-in position is suspended below the liquid container 5 for the developing liquid.

At 22 one end of the shaft 19 projects outwardly from the housing 1. This end of the shaft is provided with a handle 23 serving to rotate the shaft. Rotating the shaft effects a tilting motion of the case 16 into a position indicated with 16' and shown in dotted lines. It is to be noted that preferably the rear part of the housing through which the case 16 is outwardly tiltable is open. However also an embodiment is included in which for example a removable rear wall is provided covering this zone.

The supply container 24 proper is arranged within the case 16. Preferably the supply container is made out of a foldable foil of plastic material, which when unfolded may practically fill out the entire inner space of the case 16. The container 24 is, except for the connecting hose 25, entirely closed. The connecting hose 25 leads into the developing container 5 directly above the bottom. The hose 25 is provided with a closing device 26 which in the illustrated embodiment is formed by a known squeezing cock. It is emphasized that other stopping means are included in the invention. This will be referred to in detail later on.

The wall of the case 16 is provided with vent holes through which air may flow into or out of the case 16, depending on the extent of contents in the container 24. The arrangement of vent holes is of advantage in as much as the container 24 will collapse to the extent that it is partly emptied, so that no air corresponding to the amount of the discharged amount of liquid will flow into the container 24.

The container 24 is positioned, when the case 16 is swung in, below the developing container as being shown in FIGS. 1 and 2. If the closing device 26 is opened in this position, the developing liquid contained in container 5 flows into the container 24 within the case 16. Thereupon the closing device 26 may be closed again, so that there is no entrance opening to the container 24.

If the apparatus is to be used, first the closing device 26 is opened, then the shaft 19 is turned by means of the handle 23 so far that the case occupies the position indicated with 16'. It is evident, that for achieving the tilting movement the angular form of the levers 20, 21 is of advantage, because the branches of the levers connected to the shaft 19 remain within the housing. Also when the case 16 is tilted about approximately 90° and is held in this position, its greater part is in a position above the developing container 5. In this position the supply container 24 and the developing container 5 form communicating vessels. The liquid may flow out of the supply container 24 into the developing container 5 and the con-

5

tainers, relative to the swung-out position of the supply container 24, are dimensioned so that the required liquid level in the developing container 5 is obtained either positively, or by a liquid level indicator 46 arranged on the container 5; said indicator comprising a float and a measuring stick moved by the float and extended out of the housing 1. By observation of the measuring stick the liquid level in container 5 may be determined, so that in due course the closing device of the hose 26 communicating the container 24 and the container 5 may be closed. After the container 5 has been filled up in this manner, the case 16 may be swung back again into its position below the container 5. If the apparatus is not being used any more it is merely necessary to open the closing device 26 for returning the contents of the container 5 into the container 24.

To facilitate the operation of the invention there is shown an embodiment according to which the closing device within the flexible connecting duct to the containers may be controlled by a limit stop. This device may for instance be arranged on the rear wall of the housing 1 as indicated at 27, and is operated by the branch of the angular lever 20 approaching this place in such a way, that the closing device is opened by the action of the angular lever. In this embodiment the case 16 is swung into its outer extreme position, in which the closing device is opened automatically. When the liquid level indicator 46 shows the correct liquid level, the case 16 is swung inwardly again whereby the closing device is closed automatically, so that no further flow of developing liquid takes place.

Another embodiment of closing the connecting hose 25 is shown in FIG. 7 in an enlarged scale. Regarding the arrangement of the parts in FIG. 7, reference is taken to the swung-in position of the case 16 in FIG. 1. The connecting hose 25 is, behind its exit from the case 16 and preferably adjacent to it, wound around that branch of the angular lever 20 standing upright in the swung-in position, and is fastened to the angular lever by clips in such a way, that at least one part of the flexible hose is held immovably at a certain place of the angular lever. In addition a partition 43 is fixedly arranged within the housing. This partition carries a stop 44 cooperating with the vertical branch of the angular lever 20 at a location in which the hose 25 is wound around the angular lever. Hereby the stop 44 will squeeze the hose 25 together when the case is in its swung-in position and closes the connection between the developing container 5 and the supply container 24 arranged within the case 16. When the case 16 is swung outwardly the connection is opened simultaneously.

Suitably the stop 44 has a rounded abutment surface, so that damage of the hose 25 is positively avoided. The branch of the angular lever may also be provided with a broadening or a special support for the hose 25 at the place of abutment.

It is to be noted, that such a squeezing closure of the connecting hose by parts swinging with the case 16 and fixed parts arranged on the housing must not necessarily be formed by the angular lever 20 and a cooperating part, but that it is also possible to employ other parts and special arrangements.

As may be seen in FIG. 1 an exposure device 28 known per se is arranged within the space 3 of the housing comprising for example an exposure cylinder having a light source arranged in its interior, while a transport band serving at the same time to press the layer carriers against the cylinder is led around the cylinder. The arrangement is such, that the feeding and discharge slots for the exposure device are provided in the same housing wall as the feeding slot for the developing device.

Thus by the arrangement of the case 16 with its supply container 24 the housing may in an extremely advantageous manner be partitioned to provide a developing device in its upper part and an exposure device and

6

a supply container in the lower part. It should be noted that in this arrangement the open backside of the apparatus in the zone of space 4 of the housing is in no way annoying.

The container 24 is shown in FIGS. 3 and 4 in different views. It will be noted, that container 24 is elongated and comprises a hose extension 29. In the embodiment shown the container is made by a folded foil, for instance of polyethylene, the edges 30, 31, 32 of which being connected for instance by the use of a solvent or by welding. The container 24 has a cross section as shown in FIG. 4.

In FIG. 6 a partial view in a strongly enlarged scale of a particularly purposive embodiment of the connection between the connecting hose 25 and the supply container is shown. In such a connection it must be taken into consideration, that the supply container 24 consists of a very thin foil which is readily foldable and that just at the connection of the hose 25 it might buckle.

The hose 25 is provided with a metal sleeve 37 at its end the length of which corresponding about to the length of the connecting socket 38 of the supply container 24. A hose 39 made of elastic material such as rubber is fastened on the metal sleeve 37 and is twice as long as the metal sleeve 37, the end of which not directly contacting the metal sleeve being arranged freely. This free end is, after the connecting socket is pushed onto the metal sleeve 37 fastened at the end of the hose 39 rolled back so it will be in a position as shown in FIG. 6. By this arrangement a safe connection is formed which however is readily accomplished and easily disengaged by either rolling the hose 39 for the removal of the container 24 back to its fixedly attached end, when the connecting socket 38 is to be pulled-off or respectively by rolling it over the connecting socket 38 from its rolled-back position, after the connecting socket has been pushed onto the metal sleeve. In this the elasticity of the hose 39 affords a tight hold of the connecting socket 38 on the metal sleeve 37 without requiring additional parts for the connection. According to the illustrated simple form of embodiment of FIG. 6A the hose 25 and socket 38 are fastened on the metal sleeve 37 by the clip 40.

According to FIG. 3 the container 24 is provided with two special sections denominated with A and B. The section A may be open to the inner space of the container while the section B preferably is closed towards the inner space of the container along the dotted double line 33 by adhering the walls along the zone of the line 33 solubly, preferably by water. It is to be noted however, that a chemical as well as a mechanical connection may be provided. A mechanical connection may for example consist of serrations arranged in the opposing container walls, which will engage one another by exerting pressure thereupon and may be separated by pulling them apart. In order to facilitate the opening action flaps 47 have been arranged on the upper and lower side of the container serving as grips by which the container walls may be pulled apart.

It is not necessary that the connection along the line 33 is absolutely watertight although a watertight joint is preferred.

The illustrated special embodiment of the container 24 is used at the same time for packing the ingredients of the developing liquid. For example the caustic sodium which is readily soluble in water is packed in the section B, while section A serves to receive hydroquinone and phenidone. The substances contained in the sections A and B are not allowed to contact each other before they are used, or respectively before the developing liquid is prepared. This for instance is avoided by folding the section B of the container over the middle part of it which then in addition is wound around the section B whereby the folding lines are forming a sufficiently safe seal which will keep the substances con-

tained in the section A at this side of the container. In the embodiment shown in FIG. 5 a small plate 34, for example a piece of cardboard is used for defining the folding line more exactly. The section B for instance is placed on this plate whereupon the remaining container is wound around the plate. The dimensions of the plate 34 are chosen with respect to the length of the container 24 and the dimensions of the sections A and B so that the section A finally lies relative to the section B on the other side of the plate 34. The container folded in this way may then be placed on sale, for example in a cardboard box.

This embodiment is of advantage in that the ingredients of the developing liquid don't have to be handled with any special care. When used, the case 16 for instance is swung to the intermediate position shown in FIG. 1 in dotted lines and denominated with 36. Then the unfolded container 24 is pushed in to the case 16, and the connecting socket 29 for the hose which may be closed by a stopper is pulled through an aperture provided for this purpose in the case 16. Thereupon the hose 25 is connected with the socket 29 and the closing device 26 is opened. Suitably the case 16 is moved into its swung-in position. Then first a certain amount of water, at the most the total amount of water used for the developing liquid is poured into the developing container 5. Thereafter the case 16 may be swung in and out several times in order to completely dissolve the ingredients originally arranged in the section A. Then the soluble connection at 33 is opened so that preferably by swinging the case 16 again also the ingredients contained in this part of the container are dissolved. It is pointed out expressly that the soluble connection at 33 represents only one advantageous form of embodiment.

What I claim is:

1. In an apparatus for producing copies according to a diffusion process employing a developing liquid, the combination comprising a housing, inlet means in the housing, outlet means in the housing, a bath container in the upper portion of the housing, guide elements arranged to extend through the container and defining a series of guideways, said guide elements being arranged with one end adjacent the inlet means and the other end presented to the outlet means, a driven pair of squeezing and transport rollers in the housing arranged between the end of the guide elements and said outlet means, a box hingedly connected to the housing and movable into a first position in which it is below the bath container and within the confines of the housing and movable to a second position in which the box is disposed above the bottom of the bath container exteriorly of the housing, a hose connected at one end to the bath container, said box being provided with a plurality of apertures permitting access and escape of air, a collapsible container formed of flexible material removably mounted in said box and having a connection nipple which projects through an opening in said box for receiving the other end of said hose, said collapsible container being adapted to receive the chemical ingredients of the developing solution.

2. An apparatus according to claim 1 in which said housing is provided with a compartment opening to the

rear of said housing, and in which said box is pivotally insertable, the box having a rectilinear cross-section and extending the total width of the housing, the upper and lower faces of the box lying in a horizontal plane when the box is inserted, at least one pivoted lever rigidly secured to the box and hingedly connected to the housing, a shaft rockably mounted in the housing and projecting from one end thereof, said pivoted lever being rigidly connected to said shaft within the housing, said shaft being provided in the upper portion of the housing and disposed near the wall thereof, said housing being provided with a wall having an access opening to said compartment, said pivoted lever being connected to the end of the flat rectilinear box, the compartment being located in approximately the middle portion of the housing.

3. An apparatus according to claim 2, in which said pivoted lever is formed as an angle lever adapted to coact with stops which define said second position of the box, the hose being coiled around said lever, and a stop for the first position of the box disposed on the housing such that part of the pivoted lever around which the flexible hose is wound engages said stop in the first position of said box to compress said hose and cut off flow there-through when said box is in said first position.

4. An apparatus according to claim 1 in which said collapsible container is provided with a detachable joint for its walls at one end of the container, an inner compartment being provided by means of said joint and which is separated from the remaining part of said container.

5. A device according to claim 4 in which flaps are provided on the outside of said collapsible container in the zone of said detachable wall joint.

6. In an apparatus for producing copies with the aid of a developing liquid, a housing, inlet means in said housing for the introduction of copying sheets, outlet means in said housing for said sheets, means defining a development bath container in the upper portion of said housing, guide means extending through said bath container from said inlet means toward said outlet means and defining guideways for said sheets, means for moving said sheets along said guideways, a box having an opening therein, means connecting said box with said housing whereby the box is movable between a first position below said bath container within the housing and a second position at a higher level than the bottom of said bath container, means defining a collapsible receptacle disposed within said box, and a flexible conduit connecting the interior of said receptacle with said bath container through the opening in said box, whereby flowable material will pass from said bath container to said receptacle when said box is in said first position and from said receptacle to said bath container when the box is in said second position.

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